In the Claims

1   Claims 1-14 (Cancelled)

1   15.   (Original) A method for determining the location of a contaminant in a fluid flow system,

2   comprising the steps of:

3   (a)   injecting a conservative tracer and a partitioning tracer into the flow system at a

4   first location;

5   (b)   advecting the tracers along the flow system at a first velocity to create an advection

6   flow field;

1   (c)   extracting the tracers at a second location in the flow system;

2   (d)   introducing a perturbation to the advection flow field at a perturbation time by

3   changing and then re-establishing the advection flow at a second velocity, which

4   may be different than the first velocity, creating a unique change in the

5   concentration of the partition tracer;

6   (e)   extracting the partitioning tracer as a function of time relative to the perturbation

7   time;

8   (f)   measuring the concentration of the partitioning tracer as a function of the time; and

9   (g)   determining the location of contamination from the time of arrival of the

10   partitioning tracer relative to the perturbation time and the advection flow velocity.

1   Claims 16-32 (Cancelled)

1   33.   (Previously presented) The method of claim 15 wherein the injecting and the advecting in

2   steps (a) and (b) of claim 15 are done to inundate the entire fluid flow system with the tracers.

1   34.   (Previously presented) The method of claim 15 wherein a plurality of partitioning tracers

2   are used.

1   35.   (Previously presented) The method of claim 15 wherein the presence of the partitioning

2   tracer after the perturbation needed for location of the contaminant is also used to detect the

3   presence of the contaminant.

1   36.   (Previously presented) The method of claim 15 wherein the time of arrival is determined

2   from the leading edge of the tracer concentration curve.

1   37.   (Previously presented) The method of claim 15 wherein said second flow velocity is

2   determined from the mean time of arrival of the tracer at said second flow rate.

1   38.   (Previously presented) The method of claim 15 wherein the location of the contamination

2   is further comprised of the steps of (a) extracting the partitioning tracer at said second location at

3   said first flow rate and measuring the concentration of the partitioning tracer over a period of time

4   and (b) determining the location of the contaminant from (1) the times of arrival of the partitioning

5   tracer relative to the start time of the second advection flow after the perturbation and to the start

6   time of the first advection flow and (2) the flow rates of the second advection flow and the flow

7   rate of the first advection flow.

1 39.   (Previously presented) The method of claim 15 wherein the method of location can be used

2 to locate said contaminant at more than one location when the tracer concentrations from each

3 location are distinguishable.

1 40.   (Previously presented) The method of claim 15 wherein the method of location can be used

2 to locate more than one contaminant in a fluid flow system by using one or more tracers that

3 interact with each contaminant.

1 41.   (Previously presented) The method of claim 15 wherein the method of location can be used

2 to locate a plurality of contaminants at a plurality of locations.

1 Claims 42-47 (Cancelled)

1 48.   (Previously presented) The method of claim 33 wherein the partitioning tracer that is

2 injected into the fluid flow system is allowed sufficient time for the tracer to interact with the

3 contaminant before the tracer is advected.

1 49.   (Previously presented) The method of claim 33, wherein only the section of the fluid flow

2 system that is contaminated need be inundated with tracer.

1 50.   (Previously presented) The method of claim 33 wherein the presence of the partitioning

2 tracer after the perturbation needed for location of the contaminant is also used to detect the

3 presence of the contaminant.

1   51.   (Previously presented) The method of claim 33 wherein the time of arrival is determined

2   from the leading edge of the tracer concentration curve.

1   52.   (Previously presented) The method of claim 33 wherein said second flow velocity is

2   determined from the mean time of arrival of the tracer at said second flow rate.

1   53.   (Previously presented) The method of claim 33 wherein the method of location can be used

2   to locate said contaminant at more than one location when the tracer concentrations from each

3   location are distinguishable.

1   54.   (Previously presented) The method of claim 33 wherein the method of location can be used

2   to locate more than one contaminant in a fluid flow system by using one or more tracers that

3   interact with each contaminant.

1   55.   (Previously presented) The method of claim 33 wherein the method of location can be used

2   to locate a plurality of contaminants at a plurality of locations.

1   56.   (Previously presented) The method of claim 35 wherein the method of detection can be

2   used to detect said contaminant at more than one location when the tracer concentrations from

3   each location are distinguishable.

1   57.   (Previously presented) The method of claim 35 wherein the method of detection can be

2   used to detect more than one contaminant in a fluid flow system by using one or more tracers that

3   interact with each contaminant.

1   58.   (Previously presented) The method of claim 35 wherein the method of detection can be

2   used to detect a plurality of contaminants at a plurality of locations.

1   59.   (Previously presented) The method of claim 35 wherein said detecting is determined from

2   a comparison of the characteristic features of the measured concentrations of the conservative and

3   interactive tracers.

1   60.   (Previously presented) The method of claim 50 wherein the method of detection can be

2   used to detect said contaminant at more than one location when the tracer concentrations from

3   each location are distinguishable.

1   61.   (Previously presented) The method of claim 50 wherein the method of detection can be

2   used to detect more than one contaminant in a fluid flow system by using one or more tracers that

3   interact with each contaminant.

1   62.   (Previously presented) The method of claim 50 wherein the method of detection can be

2   used to detect a plurality of contaminants at a plurality of locations.

1   63.   (Previously presented) The method of claim 50 wherein said detecting is determined from

2   a comparison of the characteristic features of the measured concentrations of the conservative and

3   interactive tracers.

1   64.   (Previously presented) The method of claim 37 wherein said mean time of arrival is

2   determined from the centroid of the tracer concentration curve.

1   65.   (Previously presented) The method of claim 38 wherein the location is determined from

2   the product of the ratio of the time of arrival of the partitioning tracer at the second flow rate

3   relative to the first flow rate, the ratio of the flow rate of the partitioning tracer at the second flow

4   rate relative to the first flow rate, and the length of the fluid flow system between the injection and

5   extraction points.

1   66.   (Previously presented) The method of claim 52 wherein said mean time of arrival is

2   determined from the centroid of the tracer concentration curve.

1   67.   (Previously presented) The method of claim 50 wherein said characteristic features are

2   comprised of the magnitude of the tracer concentrations in certain regions of the concentration

3   curves such as the peak, the leading edge, or the trailing edge of the curves.

1   68.   (Previously presented) The method of claim 50 where said comparison is accomplished

2   using said tracer concentration curves that represent only a fraction of the total concentration curve

3   that would have been measured if the collection time were extended.

1   69.   (Previously presented) The method of claim 63 wherein said characteristic features are

2   comprised of the magnitude of the tracer concentrations in certain regions of the concentration

3   curves such as the peak, the leading edge, or the trailing edge of the curves.

1   70.   (Previously presented) The method of claim 63 where said comparison is accomplished

2   using said tracer concentration curves that represent only a fraction of the total concentration curve

3   that would have been measured if the collection time were extended.

1   Claims 71-77 (Cancelled)